REMARKS

Favorable reconsideration of this application is respectfully requested in view of the following remarks.

The Examiner is kindly thanked for noting that the English language abstract submitted with Japanese Application Publication No. 8-230634 was not correctly supplied. Though it is noted U.S. Patent No. 5,727,852 corresponding to Japanese Application Publication No. 8-230634 was cited and considered by the Examiner, submitted with this Amendment is a new Information Disclosure Statement in which the proper English language abstract is provided. The Examiner is kindly asked to return an initialed copy of Form PTO-1449 submitted with the Information Disclosure Statement. In addition, the Examiner is also kindly asked to provide initialing next to the Official Action issued by the Japanese Patent Office and the Official Action issued by the German Patent Offices in connection with corresponding foreign applications in that English language translations of these Official Actions were previously supplied and are supplied once again.

The subject matter of the present application pertains to a hydraulic brake device having useful application in systems utilizing automatic brake control. One aspect of automatic brake control with which the hydraulic brake device here has particularly useful application involves car-to-car distance control, sometimes also referred to as adaptive cruise control. In this type of automatic brake control, it is not absolutely necessary to independently control the hydraulic pressure supplied to the individual wheels. That is, adaptive cruise control can be carried out by applying the same hydraulic pressure to each of the wheels. Thus, in such a case, it is not necessary to individually operate the solenoid valves 17-1 through 17-4 and 18-1

through 18-4 shown in, for example, Fig. 1 of the present application. Nevertheless, it may still be desirable to control the hydraulic pressure supplied to the wheel cylinders.

Thus, referring by way of example to the embodiment shown in Fig. 1 of the present application, the hydraulic brake device at issue here utilizes the first proportional solenoid valve 21 in which the differential pressure between the upstream hydraulic pressure and the downstream hydraulic pressure is controllable to a value corresponding to control current applied to the first proportional solenoid valve. This proportional solenoid valve 21 allows the hydraulic pressure supplied to the wheel cylinders to be varied by controlling the current supplied to the proportional solenoid valve. In addition, during, for example, adaptive cruise control, it is desirable to be able to reduce the pressure in the wheel cylinders without once again having to do so on an individualized basis. The hydraulic brake device at issue here thus also includes a second proportional solenoid valve 22. During, adaptive cruise control, for example, this second proportional solenoid valve 22 communicates the wheel cylinders with the atmospheric reservoir 6 by way of the pressure adjusting valve 3. However, as pointed out in the present application, if the brake operating member (e.g., brake pedal) is operated during automatic brake control such as adaptive cruise control, situations may arise in which the output hydraulic pressure of the pressure adjusting valve 3 exceeds the hydraulic pressure in the hydraulic pressure supply passage 20 and the wheel cylinders. Previously, it was difficult to stop the automatic brake control quickly at the moment the hydraulic pressure of the pressure adjusting valve 3 equals the hydraulic pressure in the hydraulic pressure supply passage 20 and the wheel cylinders. The check valve 23 allows the output

hydraulic pressure of the pressure adjusting valve 3 to be immediately introduced into the hydraulic pressure supply passage 20, and thus ultimately the wheel cylinders, when the hydraulic pressure output by the pressure adjusting valve 3 exceeds the hydraulic pressure in the wheel cylinders. This reduces the possibility of a sudden change in vehicle deceleration otherwise associated with a shift from the automatic braking control to braking control associated with operation of the brake operating member.

The Official Action sets forth a rejection of independent Claims 1-3, all of which remain readable on the elected species, based on the disclosure in U.S. Patent No. 6,078,858 to *Tozu et al.* in view of the disclosure in U.S. Patent No. 5,048,292 to *Kubik*.

As discussed previously, *Tozu et al.* discloses a vehicle motion control system for maintaining vehicle stability, wherein the system includes two on-off solenoid valves SA3, STR. These on-off solenoid valves SA3, STR are either energized or not (i.e., either opened or closed) depending upon the operational state of the brake system. As discussed beginning in line 36 of column 8 of *Tozu et al.*, during steering control by braking (automatic brake control), the on-off solenoid valve SA3 is closed while the on-off solenoid valve STR is opened. This allows the power pressure from the auxiliary pressure source AP to be discharged to the wheel brake cylinders by way of the on-off solenoid valve STR and the respective solenoid valves PC1-PC8. Through operation of the solenoid valves PC1-PC8, the hydraulic pressure in each of the respective wheel cylinders is rapidly increased, gradually increased, held, gradually decreased or rapidly decreased to perform oversteer restraining control and/or understeer restraining control. Thus, during steering

control by braking (automatic braking control), the pressure in the wheel cylinders is decreased by energizing the appropriate solenoid valves PC5-PC8 and de-energizing the appropriate solenoid valves PC1-PC4.

The Official Action observes that it would have been obvious to replace the on-off solenoid valves SA3, STR in *Tozu et al.* with proportional solenoid valves in view of the disclosure in *Kubik*. That position is respectfully traversed.

Kubik discloses a system for controlling the operation of a reciprocatory hydraulic motor 10. The reciprocatory motor 10 includes a piston 14 slidably positioned within a cylinder 12 to divide the interior of the cylinder into a rod end chamber 18, a first head end chamber 20 and a second head end chamber 26. A main system pump 36 is connected to the motor 10 by way of a solenoid actuated three position control valve 44. As discussed beginning in line 28 of column 5 of *Kubik*, the system is specifically constructed to operate the motor 10 so that the piston 14 is initially rapidly driven in a forward stroke to a predetermined point, is then decelerated and subsequently driven at a relatively slow speed through the remainder of the forward stroke, and is then returned rapidly to its original position. To achieve this operation, the system employs the illustrated solenoid actuated three position control valve 44, together with the other illustrated features of the system. *Kubik* discusses beginning in line 49 of column 8 that the main pump 36 is hydraulically connected by way of the solenoid operated directional valve 44 in a closed loop system to the equal area chambers 18, 22 of the cylinder 10. As stated by *Kubik*, this allows the main pump 36 to apply a dynamic braking action to the movement of the piston rod 14 in that fluid expelled from one equal area chamber of the cylinder cannot flow into the main pump intake any faster than fluid is pumped

from the main pump outlet into the other equal area chamber of the cylinder.

Beginning in line 61 of column 8, *Kubik* goes on to note that an alternative main pump circuit possessing dynamic braking capabilities can be achieved by replacing the solenoid operated three positional control valve 44 with a commercially available electro-hydraulic proportional directional control solenoid valve. *Kubik* states that such a valve is able to partially open the valve passages to establish a selectively adjusted flow rate to and from the equal area chambers of the cylinder 10 at a selected proportion of the fully opened flow rate.

Kubik's disclosure of replacing the solenoid actuated three position directional control valve 44 with a commercially available electro-hydraulic proportional directional control solenoid valve is not a teaching that one should similarly replace the on-off solenoid valves SA3, STR in *Tozu et al.* with proportional solenoid valves as claimed here. In one respect, the solenoid valves SA3, STR in *Tozu et al.* are not three position directional control valves. Rather the solenoid valves SA3, STR in *Tozu et al.* are simply on/off valves which either permit or prevent flow. Thus, *Kubik's* disclosure of replacing a solenoid actuated three-position directional control valve with a proportional directional control solenoid valve as an alternative way of achieving the disclosed dynamic braking is not a teaching that one should similarly replace the on-off solenoid valves SA3, STR in *Tozu et al.* with proportional solenoid valves.

In addition, *Kubik's* disclosure is in no way a disclosure that all on-off solenoid valves can or should be replaced with proportional solenoid valves. Instead, the proper focus should be whether *Kubik's* disclosed reason for utilizing the electro-hydraulic proportional directional control solenoid valve is applicable to, or has useful

application in, the system described in *Tozu et al.* From this perspective, there is no reason to utilize *Kubik's* disclosure of replacing a solenoid actuated three-position directional control valve with a proportional directional control solenoid valve. *Kubik* describes a system that utilizes a solenoid actuated three position directional control valve 44 to apply a dynamic braking action to the movement of the piston rod 16, meaning that fluid expelled from one equal area chamber of the cylinder 10 cannot flow into the pump intake any faster than fluid is pumped from the main pump outlet into the other equal area chamber of the cylinder. *Kubik* then comments that this dynamic braking action can be applied to the movement of the piston rod 16 in an alternative manner through use of a proportional directional control solenoid valve.

The solenoid valves SA3, STR in *Tozu et al.* do not control fluid in a way that is designed to impart a dynamic braking action to a piston rod. Rather, the solenoid valves SA3, STR in *Tozu et al.* are intended to do nothing more than open or close depending upon the operating state of the brake system. The solenoid valves SA3, STR are not required to do anything more because it is the on-off solenoid valves PC1-PC8 which are operated to control the hydraulic pressure delivered to the wheel cylinders.

Further, as explained in the prior response, vehicle manufacturers constantly seek cost reductions in the components and systems used in vehicles. Proportional solenoid valves are quite a bit more expensive than the on-off solenoid valves SA3, STR used in *Tozu et al.* The system in *Tozu et al.* does not require, and would not benefit from utilizing, the more expensive proportional solenoid valves. Thus, there exists no reason why an ordinarily skilled artisan, well aware of the need to decrease costs in vehicle components, would employ significantly more expensive proportional

solenoid valves in place of *Tozu et al.'s* on-off solenoid valves SA3, STR in order to vary the hydraulic pressure because the hydraulic pressure is already varied/controlled through the disclosed operation of the on-off solenoid valves PC1-PC8.

On the other hand, the hydraulic brake device at issue here utilizes proportional solenoid valves to achieve operational results different from those disclosed in, or sought to be achieved by, *Tozu et al.* As mentioned, the proportional solenoid valves here allow a desired pressure to be applied to each of the wheel cylinders, without the need for independently controlling the hydraulic pressure in the respective wheel cylinders. That is, the hydraulic pressure supplied to the wheel cylinders can be varied during automatic brake control such as adaptive cruise control, without the need for operating the solenoid valves 17-1 through 17-4 and 18-1 through 18-4 to independently control the hydraulic pressure to each of the wheel cylinders.

Assuming for the sake of argument that one did replace *Tozu et al.'s* on-off solenoid valves SA3, STR with proportional solenoid valves, the result would still not be the hydraulic brake device at issue here. In the hydraulic brake device at issue here, the controller controls the first proportional solenoid valve during automatic brake control to increase the hydraulic pressure in the wheel cylinders and also controls the second proportional solenoid valve during automatic brake control to decrease the hydraulic pressure in the wheel cylinders by communicating the wheel cylinders (or pressure chamber) with the atmospheric reservoir through the second proportional solenoid valve and the pressure adjusting valve. The wording in independent Claims 1-3 is amended to make clear this control of the first and second

proportional solenoid valves by the controller. In *Tozu et al.*, during automatic brake control, the solenoid valve SA3 is not controlled by the controller to decrease the hydraulic pressure in the wheel cylinders by communicating the wheel cylinders (or pressure chamber) with the reservoir RS through the solenoid valve SA3 and the hydraulic booster HB. Rather, as explained above, *Tozu et al.* specifically describes that during steering control by braking (automatic brake control), the on-off solenoid valve SA3 is closed while the on-off solenoid valve STR is opened. Thus, even assuming for the sake of argument that an ordinarily skilled artisan would have deemed it obvious to replace the on-off solenoid valve SA3 with a proportional solenoid valve, there exists no disclosure of controlling such a proportional solenoid valve to decrease the hydraulic pressure in the wheel cylinders during automatic brake control as recited in the independent claims.

A still further distinction exists between the hydraulic brake device at issue here and the proposed modified braking system disclosed in *Tozu et al.* In *Tozu et al.,* during automatic braking, the solenoid valve SA3 is kept closed and the solenoid STR is kept open. Thus, the hydraulic pressure in the line including the solenoid valves PC1-P4 is always equal to the hydraulic pressure in the pressure accumulator AC. Thus, if the brake pedal is depressed during automatic braking control, because the output hydraulic pressure of the hydraulic booster HB, which corresponds to the pressure applied to the pedal BP, is equal to or lower than the pressure in the accumulator AC, the output hydraulic pressure of the booster HB is supplied only to the line immediately upstream of the solenoid valve SA3 and is not supplied through the check valve CV 5 into the line leading to the wheel cylinders. If the brake pedal BP is depressed with the solenoid valves PC5-PC8 in the open position during

automatic braking, and the hydraulic pressure in the line downstream of the solenoid valve SA3 and including the solenoid valves PC5-PC8 is lower than the hydraulic pressure in the accumulator AC, the output hydraulic pressure of the hydraulic booster HB can be supplied to the line downstream of the solenoid valve SA3. However, in this case, because the line downstream of the solenoid valve SA3 is open to the reservoir RS through the valves PC5-PC8, it is not possible to increase the hydraulic pressure in the line downstream of the valve SA3 (i.e., the wheel cylinder pressure) corresponding to the pressure applied to the brake pedal BP. Thus, the arrangement disclosed in *Tozu et al.* is not able to quickly increase the wheel cylinder pressure when the brake pedal BP is depressed during automatic braking.

On the other hand, as explained above, the hydraulic braking device at issue here utilizes the second proportional solenoid valve 22 to carry out hydraulic pressure reduction during automatic brake control, and so situations may arise in which if the brake pedal is depressed during automatic brake control, there is a difference between the out put hydraulic pressure of the pressure adjusting valve 3 and the hydraulic pressure in the hydraulic pressure supply passage 20. In such a situation, it is possible to immediately increase the wheel cylinder pressure corresponding to the pressure applied to the brake pedal because the check valve 23 allows the output hydraulic pressure of the pressure adjusting valve to be supplied to the hydraulic pressure supply passage and the wheel cylinders. This is not disclosed in *Tozu et al.* and would not result if the solenoid valves SA3, STR in *Tozu et al.* were replaced with proportional solenoid valves.

For at least the reasons set forth above, it is respectfully submitted that the claimed vehicle hydraulic brake device at issue here is patentably distinguishable over the combined disclosures in *Tozu et al.* and *Kubik*. Accordingly, withdrawal of the rejection of record and allowance of this application are earnestly solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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By: Matthew L. Schneider

Matthew L. Schneider
Registration No. 32,814

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620